Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

To use this spreadsheet, please fill in only the shaded boxes.

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| | |
|---|---|
| Permit Number | VA0004031 |
| Facility Name | Tyson Foods, Inc.-Glen Allen |
| Parameter | TDS (Well 3) |
| What is the number of observations in the set of background data ($n_b$)? | 17 |
| What is the number of observations in the set of monitoring data ($n_m$)? | 17 |

| | Background | Monitored Site | $[X_b-X_b(ave)]^2$ | $[X_m-X_m(ave)]^2$ |
|---|---|---|---|---|
| 1 | 39 | 484 | 10.202 | 164.443 |
| 2 | 60 | 489 | 317.049 | 61.208 |
| 3 | 86 | 534 | 1918.955 | 1382.090 |
| 4 | 31 | 497 | 125.308 | 0.031 |
| 5 | 63 | 520 | 432.885 | 537.149 |
| 6 | 60 | 498 | 317.049 | 1.384 |
| 7 | 48 | 514 | 33.708 | 295.031 |
| 8 | 14 | 461 | 794.908 | 1283.325 |
| 9 | 34 | 408 | 67.144 | 7889.619 |
| 10 | 54 | 504 | 139.379 | 51.502 |
| 11 | 44 | 508 | 3.261 | 124.913 |
| 12 | 58 | 523 | 249.826 | 685.208 |
| 13 | 10 | 514 | 1036.461 | 295.031 |
| 14 | 10 | 480 | 1036.461 | 283.031 |
| 15 | 64 | 518 | 475.497 | 448.443 |
| 16 | 32.3 | 550 | 97.894 | 2827.737 |
| 17 | 10 | 444 | 1036.461 | 2790.325 |
| 18 | | | 0.000 | 0.000 |
| 19 | | | 0.000 | 0.000 |
| 20 | | | 0.000 | 0.000 |

$X_b(ave)$ = 42.194 $X_m(ave)$ = 496.824

$T_b$ = 1.746 (from lookup table)

$T_m$ = 1.746

$s_b^2$ = 505.778 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$

$s_m^2$ = 1195.029 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

**$T_{star}$ = 45.452** $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

$W_b$ = 29.752 $= s_b^2/n_b$

$W_m$ = 70.296 $= s_m^2/n_m$

**$T_{comp}$ = 1.746** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

## There is a significant increase in this parameter

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

To use this spreadsheet, please fill in only the shaded boxes.

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| | |
|---|---|
| Permit Number | VA0004031 |
| Facility Name | Tyson Foods, Inc.-Glen Allen |
| Parameter | TKN (Well 2) |
| What is the number of observations in the set of background data ($n_b$)? | 17 |
| What is the number of observations in the set of monitoring data ($n_m$)? | 17 |

| | Background | Monitored Site | $[X_b-X_b(ave)]^2$ | $[X_m-X_m(ave)]^2$ |
|---|---|---|---|---|
| 1 | 0.3 | 1.6 | 0.033 | 0.040 |
| 2 | 0.5 | 1.8 | 0.000 | 0.000 |
| 3 | 0.5 | 2.2 | 0.000 | 0.160 |
| 4 | 0.2 | 1.7 | 0.079 | 0.010 |
| 5 | 0.67 | 1.9 | 0.036 | 0.010 |
| 6 | 0.5 | 2.2 | 0.000 | 0.160 |
| 7 | 0.5 | 2.1 | 0.000 | 0.090 |
| 8 | 0.5 | 1.5 | 0.000 | 0.090 |
| 9 | 0.5 | 1.7 | 0.000 | 0.010 |
| 10 | 0.5 | 1.8 | 0.000 | 0.000 |
| 11 | 0.5 | 0.6 | 0.000 | 1.440 |
| 12 | 0.5 | 2.2 | 0.000 | 0.160 |
| 13 | 0.5 | 1.1 | 0.000 | 0.490 |
| 14 | 0.5 | 1.2 | 0.000 | 0.360 |
| 15 | 0.5 | 1.6 | 0.000 | 0.040 |
| 16 | 0.5 | 4 | 0.000 | 4.840 |
| 17 | 0.5 | 1.4 | 0.000 | 0.160 |
| 18 | | | 0.000 | 0.000 |
| 19 | | | 0.000 | 0.000 |
| 20 | | | 0.000 | 0.000 |

$X_b(ave) = 0.481$ $X_m(ave) = 1.800$

$T_b =$ 1.746 (from lookup table)

$T_m =$ 1.746

$s_b^2 =$ 0.010 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$

$s_m^2 =$ 0.504 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

$T_{star} =$ **7.593** $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

$W_b =$ 0.001 $= s_b^2/n_b$

$W_m =$ 0.030 $= s_m^2/n_m$

$T_{comp} =$ **1.746** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

## There is a significant increase in this parameter

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

To use this spreadsheet, please fill in only the shaded boxes.

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Permit Number: VA0004031

Facility Name: Tyson Foods, Inc.-Glen Allen

Parameter: TKN (Well 4)

What is the number of observations in the set of background data ($n_b$)? 17

What is the number of observations in the set of monitoring data ($n_m$)? 17

| | Background | Monitored Site | $[X_b-X_b(ave)]^2$ | $[X_m-X_m(ave)]^2$ |
|---|---|---|---|---|
| 1 | 0.3 | 11.8 | 0.033 | 1.690 |
| 2 | 0.5 | 11.3 | 0.000 | 0.640 |
| 3 | 0.5 | 14.9 | 0.000 | 19.360 |
| 4 | 0.2 | 12.3 | 0.079 | 3.240 |
| 5 | 0.67 | 11.6 | 0.036 | 1.210 |
| 6 | 0.5 | 11.5 | 0.000 | 1.000 |
| 7 | 0.5 | 10.1 | 0.000 | 0.160 |
| 8 | 0.5 | 10.5 | 0.000 | 0.000 |
| 9 | 0.5 | 11.4 | 0.000 | 0.810 |
| 10 | 0.5 | 10.8 | 0.000 | 0.090 |
| 11 | 0.5 | 10.5 | 0.000 | 0.000 |
| 12 | 0.5 | 8.3 | 0.000 | 4.840 |
| 13 | 0.5 | 8.7 | 0.000 | 3.240 |
| 14 | 0.5 | 7.7 | 0.000 | 7.840 |
| 15 | 0.5 | 11.4 | 0.000 | 0.810 |
| 16 | 0.5 | 10.1 | 0.000 | 0.160 |
| 17 | 0.5 | 5.6 | 0.000 | 24.010 |
| 18 | | | 0.000 | 0.000 |
| 19 | | | 0.000 | 0.000 |
| 20 | | | 0.000 | 0.000 |

$X_b(ave) = 0.481$ $X_m(ave) = 10.500$

$T_b =$ 1.746 (from lookup table)

$T_m =$ 1.746

$s_b^2 =$ 0.010 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$

$s_m^2 =$ 4.319 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

$T_{star} =$ **19.857** $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

$W_b =$ 0.001 $= s_b^2/n_b$

$W_m =$ 0.254 $= s_m^2/n_m$

$T_{comp} =$ **1.746** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

## There is a significant increase in this parameter

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

To use this spreadsheet, please fill in only the shaded boxes.

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| | |
|---|---|
| Permit Number | VA0004031 |
| Facility Name | Tyson Foods, Inc.-Glen Allen |
| Parameter | Copper (Well 3) |
| What is the number of observations in the set of background data ($n_b$)? | 17 |
| What is the number of observations in the set of monitoring data ($n_m$)? | 17 |

| | Background | Monitored Site | $[X_b-X_b(ave)]^2$ | $[X_m-X_m(ave)]^2$ |
|---|---|---|---|---|
| 1 | 0.002 | 0.002 | 0.000 | 0.000 |
| 2 | 0.002 | 0.002 | 0.000 | 0.000 |
| 3 | 0.002 | 0.002 | 0.000 | 0.000 |
| 4 | 0.002 | 0.002 | 0.000 | 0.000 |
| 5 | 0.02 | 0.02 | 0.000 | 0.000 |
| 6 | 0.02 | 0.02 | 0.000 | 0.000 |
| 7 | 0.02 | 0.02 | 0.000 | 0.000 |
| 8 | 0.02 | 0.03 | 0.000 | 0.000 |
| 9 | 0.02 | 0.02 | 0.000 | 0.000 |
| 10 | 0.02 | 0.02 | 0.000 | 0.000 |
| 11 | 0.02 | 0.02 | 0.000 | 0.000 |
| 12 | 0.02 | 0.02 | 0.000 | 0.000 |
| 13 | 0.02 | 0.02 | 0.000 | 0.000 |
| 14 | 0.02 | 0.03 | 0.000 | 0.000 |
| 15 | 0.02 | 0.02 | 0.000 | 0.000 |
| 16 | 0.02 | 0.02 | 0.000 | 0.000 |
| 17 | 0.02 | 0.02 | 0.000 | 0.000 |
| 18 | | | 0.000 | 0.000 |
| 19 | | | 0.000 | 0.000 |
| 20 | | | 0.000 | 0.000 |

$X_b(ave) = 0.016$ $X_m(ave) = 0.017$

$T_b =$ 1.746 (from lookup table)

$T_m =$ 1.746

$s_b^2 =$ 0.000 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$

$s_m^2 =$ 0.000 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

**$T_{star} =$ 0.402** $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

$W_b =$ 0.000 $= s_b^2/n_b$

$W_m =$ 0.000 $= s_m^2/n_m$

**$T_{comp} =$ 1.746** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

## There is no significant difference between the monitoring data and the background data

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

To use this spreadsheet, please fill in only the shaded boxes.

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| | |
|---|---|
| Permit Number | VA0004031 |
| Facility Name | Tyson Foods, Inc.-Glen Allen |
| Parameter | Sodium (Well 2) |
| What is the number of observations in the set of background data ($n_b$)? | 17 |
| What is the number of observations in the set of monitoring data ($n_m$)? | 17 |

| | Background | Monitored Site | $[X_b-X_b(ave)]^2$ | $[X_m-X_m(ave)]^2$ |
|---|---|---|---|---|
| 1 | 3.58 | 51.76 | 2.846 | 78.146 |
| 2 | 3.5 | 49.8 | 3.122 | 47.334 |
| 3 | 2.3 | 50.18 | 8.803 | 52.708 |
| 4 | 4.86 | 46.7 | 0.166 | 14.288 |
| 5 | 4 | 47 | 1.605 | 16.646 |
| 6 | 3.9 | 47 | 1.869 | 16.646 |
| 7 | 26 | 2 | 429.855 | 1674.446 |
| 8 | 3 | 46 | 5.140 | 9.486 |
| 9 | 3 | 49 | 5.140 | 36.966 |
| 10 | 4 | 47 | 1.605 | 16.646 |
| 11 | 5 | 44 | 0.071 | 1.166 |
| 12 | 4 | 42 | 1.605 | 0.846 |
| 13 | 4 | 44 | 1.605 | 1.166 |
| 14 | 5 | 42 | 0.071 | 0.846 |
| 15 | 5 | 39 | 0.071 | 15.366 |
| 16 | 3.9 | 42.1 | 1.869 | 0.672 |
| 17 | 4.5 | 40.1 | 0.588 | 7.952 |
| 18 | | | 0.000 | 0.000 |
| 19 | | | 0.000 | 0.000 |
| 20 | | | 0.000 | 0.000 |

$X_b(ave)$ = 5.267 $X_m(ave)$ = 42.920

$T_b$ = 1.746 (from lookup table)

$T_m$ = 1.746

$s_b^2$ = 29.127 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$

$s_m^2$ = 124.458 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

**$T_{star}$ = 12.527** $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

$W_b$ = 1.713 $= s_b^2/n_b$

$W_m$ = 7.321 $= s_m^2/n_m$

**$T_{comp}$ = 1.746** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

## There is a significant increase in this parameter

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

To use this spreadsheet, please fill in only the shaded boxes.

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| | |
|---|---|
| Permit Number | VA0004031 |
| Facility Name | Tyson Foods, Inc.-Glen Allen |
| Parameter | Sodium (Well 4) |
| What is the number of observations in the set of background data ($n_b$)? | 17 |
| What is the number of observations in the set of monitoring data ($n_m$)? | 17 |

| | Background | Monitored Site | $[X_b-X_b(ave)]^2$ | $[X_m-X_m(ave)]^2$ |
|---|---|---|---|---|
| 1 | 3.58 | 41.42 | 2.846 | 22.501 |
| 2 | 3.5 | 34.8 | 3.122 | 3.521 |
| 3 | 2.3 | 40.04 | 8.803 | 11.313 |
| 4 | 4.86 | 40.84 | 0.166 | 17.335 |
| 5 | 4 | 40 | 1.605 | 11.046 |
| 6 | 3.9 | 34 | 1.869 | 7.163 |
| 7 | 26 | 33 | 429.855 | 13.516 |
| 8 | 3 | 33 | 5.140 | 13.516 |
| 9 | 3 | 35 | 5.140 | 2.811 |
| 10 | 4 | 38 | 1.605 | 1.752 |
| 11 | 5 | 37 | 0.071 | 0.105 |
| 12 | 4 | 34 | 1.605 | 7.163 |
| 13 | 4 | 39 | 1.605 | 5.399 |
| 14 | 5 | 35 | 0.071 | 2.811 |
| 15 | 5 | 35 | 0.071 | 2.811 |
| 16 | 3.9 | 37.9 | 1.869 | 1.497 |
| 17 | 4.5 | 35.5 | 0.588 | 1.384 |
| 18 | | | 0.000 | 0.000 |
| 19 | | | 0.000 | 0.000 |
| 20 | | | 0.000 | 0.000 |

$X_b(ave) = 5.267$ $X_m(ave) = 36.676$

$T_b =$ 1.746 (from lookup table)

$T_m =$ 1.746

$s_b^2 =$ 29.127 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$

$s_m^2 =$ 7.853 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

**$T_{star} =$ 21.296** $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

$W_b =$ 1.713 $= s_b^2/n_b$

$W_m =$ 0.462 $= s_m^2/n_m$

**$T_{comp} =$ 1.746** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

## There is a significant increase in this parameter

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

To use this spreadsheet, please fill in only the shaded boxes.

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| | |
|---|---|
| Permit Number | VA0004031 |
| Facility Name | Tyson Foods, Inc.-Glen Allen |
| Parameter | Zinc (Well 3) |
| What is the number of observations in the set of background data ($n_b$)? | 17 |
| What is the number of observations in the set of monitoring data ($n_m$)? | 17 |

| | Background | Monitored Site | $[X_b-X_b(ave)]^2$ | $[X_m-X_m(ave)]^2$ |
|---|---|---|---|---|
| 1 | 0.02 | 0.02 | 0.000 | 0.000 |
| 2 | 0.05 | 0.07 | 0.001 | 0.003 |
| 3 | 0.04 | 0.02 | 0.000 | 0.000 |
| 4 | 0.02 | 0.02 | 0.000 | 0.000 |
| 5 | 0.01 | 0.02 | 0.000 | 0.000 |
| 6 | 0.02 | 0.01 | 0.000 | 0.000 |
| 7 | 0.03 | 0.02 | 0.000 | 0.000 |
| 8 | 0.01 | 0.02 | 0.000 | 0.000 |
| 9 | 0.01 | 0.02 | 0.000 | 0.000 |
| 10 | 0.01 | 0.02 | 0.000 | 0.000 |
| 11 | 0.01 | 0.01 | 0.000 | 0.000 |
| 12 | 0.04 | 0.01 | 0.000 | 0.000 |
| 13 | 0.01 | 0.01 | 0.000 | 0.000 |
| 14 | 0.01 | 0.02 | 0.000 | 0.000 |
| 15 | 0.01 | 0.01 | 0.000 | 0.000 |
| 16 | 0.02 | 0.01 | 0.000 | 0.000 |
| 17 | 0.01 | 0.01 | 0.000 | 0.000 |
| 18 | | | 0.000 | 0.000 |
| 19 | | | 0.000 | 0.000 |
| 20 | | | 0.000 | 0.000 |

$X_b(ave) = 0.019$ $X_m(ave) = 0.019$

| | | |
|---|---|---|
| $T_b =$ | 1.746 | (from lookup table) |
| $T_m =$ | 1.746 | |
| $s_b^2 =$ | 0.000 | $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$ |
| $s_m^2 =$ | 0.000 | $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$ |
| **$T_{star} =$** | **-0.127** | $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$ |
| $W_b =$ | 0.000 | $= s_b^2/n_b$ |
| $W_m =$ | 0.000 | $= s_m^2/n_m$ |
| **$T_{comp} =$** | **1.746** | $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$ |

**There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity**

## Tyson Foods, Inc. - Glen Allen, (VA0004031)

Ammonia-N (mg/l)

**Groundwater Data Analysis for Non-normal Data**

| Parameter | NH3 |
|---|---|
| Monitoring Well 1 | Monitoring Well 2 |
| Up Gradient Data | Down Gradient Data |
| 0.1 | 1.5 |
| 0.1 | 1.2 |
| 0.1 | 1.8 |
| 0.1 | 1.7 |
| 0.05 | 3.35 |
| 0.18 | 116 |
| 0.6 | 1.58 |
| 0.5 | 3.25 |
| 0.05 | 2.82 |
| 0.24 | 2.03 |
| 0.05 | 0.88 |
| 0.08 | 1.39 |
| 0.1 | 0.1 |
| 0.1 | 1.1 |
| 0.06 | 1.39 |
| 0.05 | 1.24 |
| 0.08 | 1.37 |
| Maximum 0.6 | Maximum 116 |
| Is there a significant | YES |

| Parameter | NH3 |
|---|---|
| Monitoring Well 1 | Monitoring Well 3 |
| Up Gradient Data | Down Gradient Data |
| 0.1 | 79.3 |
| 0.1 | 56.4 |
| 0.1 | 72 |
| 0.1 | 81.2 |
| 0.05 | 82.8 |
| 0.18 | 5.17 |
| 0.6 | 59.6 |
| 0.5 | 62.9 |
| 0.05 | 92.7 |
| 0.24 | 76.7 |
| 0.05 | 74.9 |
| 0.08 | 73.6 |
| 0.1 | 8.67 |
| 0.1 | 74.6 |
| 0.06 | 141 |
| 0.05 | 61.8 |
| 0.08 | 62.3 |
| Maximum 0.6 | Maximum 141 |
| Is there a significant | YES |

| Parameter | NH3 |
|---|---|
| Monitoring Well 1 | Monitoring Well 4 |
| Up Gradient Data | Down Gradient Data |
| 0.1 | 10.7 |
| 0.1 | 8.4 |
| 0.1 | 12.1 |
| 0.1 | 10.9 |
| 0.05 | 15.5 |
| 0.18 | 32.6 |
| 0.6 | 11.7 |
| 0.5 | 11.5 |
| 0.05 | 13.9 |
| 0.24 | 11.4 |
| 0.05 | 10.2 |
| 0.08 | 7.45 |
| 0.1 | 0.67 |
| 0.1 | 5.5 |
| 0.06 | 7.12 |
| 0.05 | 7.32 |
| 0.08 | 7.82 |
| Maximum 0.6 | Maximum 32.6 |
| Is there a significant | YES |

## Tyson Foods, Inc. - Glen Allen, (VA0004031)

Chloride (mg/l)

**Groundwater Data Analysis for Non-normal Data**

| Parameter | Chloride |
|---|---|
| Monitoring Well 1 | Monitoring Well 2 |
| Up Gradient Data | Down Gradient Data |
| 4 | 53 |
| 3 | 52 |
| 2 | 47 |
| 2 | 43 |
| 2.7 | 59.6 |
| 2.6 | 49.6 |
| 3 | 47 |
| 2 | 45 |
| 4 | 41 |
| 2 | 36 |
| 5 | 39 |
| 5 | 39 |
| 2 | 38 |
| 1 | 38 |
| 8 | 38 |
| 3 | 38 |
| 6 | 33 |
| Maximum 8 | Maximum 59.6 |
| Is there a significant | YES |

| Parameter | Chloride |
|---|---|
| Monitoring Well 1 | Monitoring Well 3 |
| Up Gradient Data | Down Gradient Data |
| 4 | 51 |
| 3 | 47 |
| 2 | 42 |
| 2 | 46 |
| 2.7 | 67.9 |
| 2.6 | 54.6 |
| 3 | 68 |
| 2 | 63 |
| 4 | 78 |
| 2 | 81 |
| 5 | 69 |
| 5 | 78 |
| 2 | 19 |
| 1 | 66 |
| 8 | 54 |
| 3 | 67 |
| 6 | 73 |
| Maximum 8 | Maximum 81 |
| Is there a significant | YES |

| Parameter | Chloride |
|---|---|
| Monitoring Well 1 | Monitoring Well 4 |
| Up Gradient Data | Down Gradient Data |
| 4 | 15 |
| 3 | 9 |
| 2 | 10 |
| 2 | 9 |
| 2.7 | 23.4 |
| 2.6 | 17.4 |
| 3 | 17 |
| 2 | 22 |
| 4 | 21 |
| 2 | 123 |
| 5 | 26 |
| 5 | 20 |
| 2 | 20 |
| 1 | 19 |
| 8 | 29 |
| 3 | 20 |
| 6 | 20 |
| Maximum 8 | Maximum 123 |
| Is there a significant | YES |

## Tyson Foods, Inc. - Glen Allen, (VA0004031)

Nitrite (mg/l)

**Groundwater Data Analysis for Non-normal Data**

| Parameter | Nitrite |
|---|---|
| Monitoring Well 1 | Monitoring Well 2 |
| Up Gradient Data | Down Gradient Data |
| 0.01 | 0.01 |
| 0.01 | 0.01 |
| 0.01 | 0.01 |
| 0.01 | 0.01 |
| 0.05 | 0.05 |
| 0.01 | 0.01 |
| 0.11 | 0.02 |
| 0.02 | 0.02 |
| 0.07 | 0.02 |
| 0.02 | 0.02 |
| 0.05 | 0.34 |
| 0.14 | 0.03 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| Maximum 0.14 | Maximum 0.34 |
| Is there a significant YES | |

| Parameter | Nitrite |
|---|---|
| Monitoring Well 1 | Monitoring Well 3 |
| Up Gradient Data | Down Gradient Data |
| 0.01 | 0.01 |
| 0.01 | 0.01 |
| 0.01 | 0.01 |
| 0.01 | 0.01 |
| 0.05 | 0.05 |
| 0.01 | 0.01 |
| 0.11 | 0.03 |
| 0.02 | 0.02 |
| 0.07 | 0.03 |
| 0.02 | 0.02 |
| 0.05 | 0.02 |
| 0.14 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| Maximum 0.14 | Maximum 0.05 |
| Is there a significant No | |

| Parameter | Nitrite |
|---|---|
| Monitoring Well 1 | Monitoring Well 4 |
| Up Gradient Data | Down Gradient Data |
| 0.01 | 0.01 |
| 0.01 | 0.01 |
| 0.01 | 0.03 |
| 0.01 | 0.01 |
| 0.05 | 0.05 |
| 0.01 | 0.01 |
| 0.11 | 0.05 |
| 0.02 | 0.02 |
| 0.07 | 0.02 |
| 0.02 | 0.03 |
| 0.05 | 0.02 |
| 0.14 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| 0.02 | 0.02 |
| Maximum 0.14 | Maximum 0.05 |
| Is there a significant No | |

## Tyson Foods, Inc. - Glen Allen, (VA0004031)

Sulfate (mg/l)

**Groundwater Data Analysis for Non-normal Data**

| Parameter | Sulfate |
|---|---|
| Monitoring Well 1 | Monitoring Well 2 |
| Up Gradient Data | Down Gradient Data |
| 5 | 5 |
| 5 | 6 |
| 5 | 6 |
| 5 | 9 |
| 0.6 | 14.5 |
| 173 | 21.2 |
| 5 | 28 |
| 3 | 30 |
| 5 | 34 |
| 6 | 36 |
| 3 | 36 |
| 121 | 34 |
| 4 | 34 |
| 5 | 34 |
| 18 | 34 |
| 3.7 | 41.1 |
| 3.34 | 29.7 |
| Maximum 173 | Maximum 41.1 |
| Is there a significant | No |

| Parameter | Sulfate |
|---|---|
| Monitoring Well 1 | Monitoring Well 3 |
| Up Gradient Data | Down Gradient Data |
| 5 | 5 |
| 5 | 5 |
| 5 | 5 |
| 5 | 5 |
| 0.6 | 1.5 |
| 173 | 20 |
| 5 | 8 |
| 3 | 28 |
| 5 | 7 |
| 6 | 7 |
| 3 | 3 |
| 121 | 2 |
| 4 | 3 |
| 5 | 22 |
| 18 | 3 |
| 3.7 | 5.8 |
| 3.34 | 7.26 |
| Maximum 173 | Maximum 28 |
| Is there a significant | No |

| Parameter | Sulfate |
|---|---|
| Monitoring Well 1 | Monitoring Well 4 |
| Up Gradient Data | Down Gradient Data |
| 5 | 5 |
| 5 | 5 |
| 5 | 5 |
| 5 | 5 |
| 0.6 | 9.7 |
| 173 | 9.7 |
| 5 | 5 |
| 3 | 6 |
| 5 | 15 |
| 6 | 8 |
| 3 | 3 |
| 121 | 33 |
| 4 | 8 |
| 5 | 21 |
| 18 | 3 |
| 3.7 | 4.4 |
| 3.34 | 1 |
| Maximum 173 | Maximum 33 |
| Is there a significant | No |

## Tyson Foods, Inc. - Glen Allen, (VA0004031)

TKN (mg/l)

**Groundwater Data Analysis for Non-normal Data**

| Parameter | TKN |
|---|---|
| Monitoring Well 1 | Monitoring Well 2 |
| Up Gradient Data | Down Gradient Data |
| 0.3 | 1.6 |
| 0.5 | 1.8 |
| 0.5 | 2.2 |
| 0.2 | 1.7 |
| 0.67 | 1.9 |
| 0.5 | 2.2 |
| 0.5 | 2.1 |
| 0.5 | 1.5 |
| 0.5 | 1.7 |
| 0.5 | 1.8 |
| 0.5 | 0.6 |
| 0.5 | 2.2 |
| 0.5 | 1.1 |
| 0.5 | 1.2 |
| 0.5 | 1.6 |
| 0.5 | 4 |
| 0.5 | 1.4 |
| Maximum 0.67 | Maximum 4 |
| Is there a significant | YES |

| Parameter | TKN |
|---|---|
| Monitoring Well 1 | Monitoring Well 3 |
| Up Gradient Data | Down Gradient Data |
| 0.3 | 85.1 |
| 0.5 | 66.9 |
| 0.5 | 83.7 |
| 0.2 | 94.7 |
| 0.67 | 71.5 |
| 0.5 | 72.1 |
| 0.5 | 73.8 |
| 0.5 | 86.5 |
| 0.5 | 83 |
| 0.5 | 82.4 |
| 0.5 | 70 |
| 0.5 | 80.4 |
| 0.5 | 82.1 |
| 0.5 | 99.2 |
| 0.5 | 105 |
| 0.5 | 94.6 |
| 0.5 | 63.8 |
| Maximum 0.67 | Maximum 105 |
| Is there a significant | YES |

| Parameter | TKN |
|---|---|
| Monitoring Well 1 | Monitoring Well 4 |
| Up Gradient Data | Down Gradient Data |
| 0.3 | 11.8 |
| 0.5 | 11.3 |
| 0.5 | 14.9 |
| 0.2 | 12.3 |
| 0.67 | 11.6 |
| 0.5 | 11.5 |
| 0.5 | 10.1 |
| 0.5 | 10.5 |
| 0.5 | 11.4 |
| 0.5 | 10.8 |
| 0.5 | 10.5 |
| 0.5 | 8.3 |
| 0.5 | 8.7 |
| 0.5 | 7.7 |
| 0.5 | 11.4 |
| 0.5 | 10.1 |
| 0.5 | 5.6 |
| Maximum 0.67 | Maximum 14.9 |
| Is there a significant | YES |

## Tyson Foods, Inc. - Glen Allen, (VA0004031)

Sodium (mg/l)

**Groundwater Data Analysis for Non-normal Data**

| Parameter | Sodium |
|---|---|
| Monitoring Well 1 | Monitoring Well 2 |
| Up Gradient Data | Down Gradient Data |
| 3.58 | 51.76 |
| 3.5 | 49.8 |
| 2.3 | 50.18 |
| 4.86 | 46.7 |
| 4 | 47 |
| 3.9 | 47 |
| 26 | 2 |
| 3 | 46 |
| 3 | 49 |
| 4 | 47 |
| 5 | 44 |
| 4 | 42 |
| 4 | 44 |
| 5 | 42 |
| 5 | 39 |
| 3.9 | 42.1 |
| 4.5 | 40.1 |
| Maximum 26 | Maximum 51.76 |
| Is there a significant | YES |

| Parameter | Sodium |
|---|---|
| Monitoring Well 1 | Monitoring Well 3 |
| Up Gradient Data | Down Gradient Data |
| 3.58 | 66.1 |
| 3.5 | 60.5 |
| 2.3 | 61.7 |
| 4.86 | 64.28 |
| 4 | 65 |
| 3.9 | 64 |
| 26 | 24 |
| 3 | 63 |
| 3 | 70 |
| 4 | 82 |
| 5 | 73 |
| 4 | 73 |
| 4 | 70 |
| 5 | 70 |
| 5 | 68 |
| 3.9 | 76.6 |
| 4.5 | 75.8 |
| Maximum 26 | Maximum 82 |
| Is there a significant | YES |

| Parameter | Sodium |
|---|---|
| Monitoring Well 1 | Monitoring Well 4 |
| Up Gradient Data | Down Gradient Data |
| 3.58 | 41.42 |
| 3.5 | 34.8 |
| 2.3 | 40.04 |
| 4.86 | 40.84 |
| 4 | 40 |
| 3.9 | 34 |
| 26 | 33 |
| 3 | 33 |
| 3 | 35 |
| 4 | 38 |
| 5 | 37 |
| 4 | 34 |
| 4 | 39 |
| 5 | 35 |
| 5 | 35 |
| 3.9 | 37.9 |
| 4.5 | 35.5 |
| Maximum 26 | Maximum 41.42 |
| Is there a significant | YES |

**DEPARTMENT OF ENVIRONMENTAL QUALITY**
**RECEIPTS TRANSMITTAL LOG**
**COPIES RECEIPTS**

**Piedmont Regional Office**



| DIVISION | COMPANY NAME | PURPOSE | CHECK NUMBER | CHECK AMOUNT |
|---|---|---|---|---|
| PRO | Nestle Purina Petcare Co | Tank Registration | 40002677 | $50.00 |
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| | | | Total | $50.00 |

**D.C. Number** _____ **Deposit Date** _____

| TRANS | COST | FUND | PROG/SUB | OBJ/SRC | PROJ | TOTAL |
|---|---|---|---|---|---|---|
| | | | | | | |

**Received By:** ___ **June Simba**

**Date:** 11/9/2010

# COMMONWEALTH of VIRGINIA

## STATE WATER CONTROL BOARD

Richard N. Burton
Executive Director

4900 Cox Road

Please reply to: Piedmont Regional Office
P. O. Box 11143
Richmond, Virginia 23230
(804) 527-5020

Gerard Seeley, Jr.
Regional Director

January 9, 1992

Mr. John H. Reid
President
Reid Engineering Company, Inc.
1211 Caroline Street
Fredericksburg, Virginia 22401

RE: Tyson Foods, Inc., Glen Allen, Virginia
Ground Water Remediation Plan

Dear Mr. Reid:

The staff of the State Water Control Board has reviewed the supplement dated October 21, 1991 to the ground water remediation plan for Tyson Foods, Glen Allen. The proposed abatement procedures are technically adequate and the plan is approved subject to the following conditions:

1. Please confirm the pumping schedule for the recovery wells. The January 14, 1991 plan indicated that pumping was to be continuous at a rate of approximately 24 gallons per minute (2 gallons per minute per well). We understand that to mean that the recovery wells are to be pumped 24 hours per day, 7 days per week.

2. All monitoring reports are to be submitted by the tenth of the month following the monitoring period.

3. An annual status report is required in January 1993 and yearly thereafter, if necessary. A completion report is also required.

4. Regarding Appendix 3 -- Ground Water Remediation Plan Implementation Schedule, the monitoring following abatement must be done at least monthly for a period of 6 months. The perpetual monitoring, if needed, must be done on a quarterly basis.

5. The ground water monitoring program approved in March 1990 requires quarterly monitoring for a more comprehensive list of constituents than the indicator parameters cited in the October 21 submittal. The quarterly monitoring required by the March 1990 approval must continue. That monitoring will

# Reid Engineering Company, Inc.

703-371-8500
703-786-2733
FAX 703-371-8576

Consulting Environmental Engineers
Industrial Wastewater Treatment Specialists

1211 CAROLINE STREET, FREDERICKSBURG, VIRGINIA 22401


October 21, 1991


Mr. Ray Jenkins, Jr.
Environmental Engineer Senior
Piedmont Regional Office
State Water Control Board
Commonwealth of Virginia
4900 Cox Road
Innsbrook Corporate Center
P. O. Box 11143
Richmond, Virginia 23230

**SUBJECT: TYSON FOODS, INC., GLEN ALLEN, VIRGINIA**
**GROUNDWATER REMEDIATION PLAN**

Dear Ray:

As you requested in our meeting on September 25, 1991 concerning the proposed Tyson Foods, Glen Allen, Virginia groundwater remediation plan, this letter and attached groundwater contour map, aquifer analysis, and implementation schedule are submitted to the State Water Control Board to provide the additional information that you requested during our meeting.

As requested by Dr. Sinha, a groundwater contour map has been prepared and is attached in Appendix #1. This groundwater contour map clearly indicates a south to southeasterly flow of groundwater under the existing lagoons. This groundwater contour map also indicates that, at present, the unnamed tributary stream at the south end of the Glen Allen processing plant site is the present final discharge point for groundwater flow under the existing lagoons. The proposed groundwater remediation plan will call for the installation of twelve groundwater recovery wells across the south end of the new treatment plant site. Proper operation of this groundwater recovery-remediation system will result in elimination of contaminated groundwater flow into the unnamed tributary stream.

1. Initial groundwater collection and pumping phase prior to elimination of operation of existing unlined waste treatment lagoons.

2. Groundwater remediation phase after new treatment system improvements are operational and further operation of existing unlined waste treatment lagoons is eliminated.

3. Post remediation phase with reduced groundwater monitoring schedule.

4. Perpetual monitoring phase with periodic groundwater monitoring.

As agreed in our meeting, the following parameters will be tested as indicator pollutants in the groundwater samples taken from MW #1, 2, 3 & 4 during all phases of the remediation plan:

Ammonia
TKN
TDS
Specific Conductivity
pH
Zinc

One composite sample of the combined pumped groundwater flow will also be obtained from the proposed new groundwater collection manhole for testing.

Reid Engineering Company will be submitting a Lagoon Closure Plan for the Glen Allen site to the State Water Control Board by mid December. As you noted in our meeting, the requirement for a Perpetual Monitoring Phase at the end of the remediation work will depend upon the closure method proposed by Tyson Foods, Inc. in the Lagoon Closure Plan.

As noted by Mike Motsinger, assistant processing plant manager at Glen Allen, Tyson Foods desires to obtain expedited approval of the proposed groundwater remediation plan from the Virginia State Water Control Board so that they can proceed with the installation and operation of the groundwater remediation recovery wells to improve groundwater quality as rapidly as possible. Tyson Foods desires to eliminate the seepage of contaminants from the existing

| | EVENT | DATE | TESTING SCHEDULE |
|---|---|---|---|
| 1. | Initial groundwater collection phase prior to elimination of operation of unlined treatment lagoons | Jan. 1, 1992 | 1/3 months |
| 2. | Complete construction of wastewater treatment system improvements and eliminate operation of unlined treatment lagoons | Oct. 1, 1992 | 1 test by Jan. 1, 1993 |
| 3. | Groundwater Remediation Phase | Commence Jan. 1, 1993 | 1/month |
| 4. | Groundwater Remediation Phase by achieving groundwater equal to quality of upgradient MW #1 | Jan. 1, 1994 | 1/month |
| 5. | Post remediation phase to confirm completion of remediation plan | Jan. 1, 1995 | 6 tests over 12 month period |
| 6. | Perpetual monitoring phase | No Completion Date | 1/12 months |

# ATTACHMENT I

- **4/9/92 Lagoon Closure Plan**

LAGOON CLOSURE PLAN

FOR

TYSON FOODS, INC.
POULTRY PROCESSING PLANT

Glen Allen, VA

## I. INTRODUCTION

This report presents a proposed closure plan for three (3) wastewater treatment lagoons at the Tyson Foods, Inc. Poultry Processing Plant in Glen Allen, VA. The closure plan and subsequent closure of the lagoons have been mandated by the Virginia Water Control Board. This report includes:

* site description,
* description of the proposed lagoon closure procedure,
* post-closure maintenance plan,
* proposed lagoon closure schedule.

## II. DESCRIPTION OF SITE & EXISTING LAGOONS

The Tyson Foods, Inc. Poultry Processing Plant is located approximately 18 miles north west of Richmond, VA on Highway 33. The plant was purchased by Holly Farms in 1963 for the processing of poultry products. The three (3) wastewater treatment lagoons to be closed were constructed in 1968 east of the plant facility to treat wastewater generated in the processing operation. The lagoons include one anaerobic lagoon (Lagoon No. 1) and two (2) unaerated lagoons for storage of waste activated sludge (Lagoon No. 3 and No. 4). The site is shown in Appendix I - Topographic Map of Lagoon Closure Area. The three (3) lagoons were constructed using on-site soils on the bottom and side slopes. At the time of construction, these soils were not tested for compaction or permeability. The effectiveness of these soils in preventing leakage is, therefore, questionable. Groundwater monitoring data gathered by Tyson Foods, Inc. in 1990 and 1991, indicates concentrations of certain pollutants to be elevated above background groundwater quality levels. Use of these lagoons will be discontinued after proposed improvements to the wastewater treatment system are completed in late 1992. A system of groundwater collection wells and well pumps will also be installed in 1992 to achieve groundwater remediation to background levels.

Sludge thickness measurements and sampling have also been performed in each lagoon. As shown in Appendix II, Lagoon

6. Continue to monitor the quality of groundwater collected in the recovery wells, by analyzing on a quarterly frequency, samples pumped from the groundwater remediation recovery well system until groundwater pollutant levels are either reduced to background levels or to relatively stable levels which do not cause groundwater quality to be at risk.

7. Continue to monitor the levels of accumulated sludge in each lagoon to observe sludge volume reduction from endogenous respiration accomplished by dosage of Byo-Gon activator.

## IV. POST CLOSURE MAINTENANCE PLAN

This proposed "materials in place" lagoon closure plan is not a "clean close" grade over plan but is essentially a long term lagoon management plan. This lagoon closure or management plan is especially suitable when accomplished simultaneously with the proposed Groundwater Remediation Plan in which groundwater will be collected, tested and recycled to the Tyson Foods, Glen Allen treatment plant for ultimate disposal.

This lagoon closure plan is proposed based on the assumption that discontinuing operation of these lagoons combined with lagoon solids volume reduction and lagoon supernatant disposal will eliminate further potential seepage of pollutants into the groundwater. This closure goal will be confirmed by on-going groundwater sampling and testing during the Groundwater Remediation Phase coupled with the backup protection of the groundwater collection, pumping, treatment, and disposal plan.

Facility = Tyson Foods, Inc.-Glen Allen
Chemical = Copper (w/ Clean Metals Sampling)
Chronic averaging period = 4
WLAa = 23 µg/L
WLAc = 14 µg/L
Q.L. = 4
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

# observations = 1
Expected Value = 5.8
Variance = 12.1104
C.V. = 0.6
97th percentile daily values = 14.1138
97th percentile 4 day average = 9.64998
97th percentile 30 day average= 6.99510
# < Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

5.8 µg/L ← Data taken from Albion Environmental, College Station, TX., Clean Metal Study, using samples taken 7/12 & 7/13/99.

Facility = Tyson Foods, Inc.-Glen Allen
Chemical = Nickel (w/ Clean Metals Sampling)
Chronic averaging period = 4
WLAa = 290 µg/L
WLAc = 32 µg/L
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

# observations = 1
Expected Value = 2.5
Variance = 2.25
C.V. = 0.6
97th percentile daily values = 6.08354
97th percentile 4 day average = 4.15947
97th percentile 30 day average= 3.01513
# < Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

2.5 µg/L ← Data taken from Albion Environmental, College Station TX.
-- Clean Metals Study using samples taken 7/12 & 7/13/99.

# Tyson Foods (Richmond VA) Clean Metals Study
# Sampling Event # 1 (12-13 July ) Narrative Report

## Clean Field Sampling

Field sampling was conducted on 12-13 July 1999 by Dr. Paul Boothe (Albion Environmental) with the assistance of Mr. Eric Whitehurst and Mr. D'Juan Spencer (Tyson Foods). All samples collected during this event are summarized in the attached data report. Total recoverable and dissolved copper (Cu) and nickel (Ni) concentrations were measured in all samples.

All field sampling was performed using clean sampling techniques in accordance with the U.S. Environmental Protection Agency method 1669. New, non-powdered vinyl gloves were worn at each sampling point by any person touching any of the sampling equipment. All equipment in contact with the sample (i.e. sample bottles, pump tubing and cartridge filters) was rigorously acid pre-cleaned under clean conditions and certified to be analyte-free down to the low method detection limits (MDL) achieved in this study. All equipment was sealed in double plastic bags for shipment to the field. Sample bottles were kept doubled bagged at all times except when actually taking samples.

Prior to sampling at each station, the site was prepared by covering the work area with a new plastic tarp. All sample handling was done within a plastic shrouded enclosure. A new, pre-cleaned tubing set was used for each sampling episode. The tubing was connected to a pre-cleaned piece of pvc pipe which was used to position the inlet end of the sample tubing in the effluent being sampled. Both total recoverable and dissolved field blanks were taken at the effluent sampling site prior to the start of sampling. Field duplicates for both total recoverable and dissolved effluent samples were taken. In addition, a single total recoverable grab of freshwater coming into the plant site (water house) was collected.

The 24 hour total recoverable composite effluent sample was collected using the same refrigerated ISCO sampler installed at the site and used to collect routine effluent compliance monitoring samples. A new, pre-cleaned tubing set (provided by Albion) was installed on the sampler for this composite sampling event. The sampler was set to collect 60 ml effluent samples every 30 minutes. The sampler worked nominally for this composite sampling event. As required by EPA method 1669, a composite dissolved effluent sample was obtained by collecting three separate dissolved grabs over the 24 hour compositing period. A new, pre-cleaned tubing set and 0.45 um cartridge filter was used for real-time filtration during each dissolved grab sampling episode. The three dissolved grabs were preserved and composited (equal aliquots from each of three grabs) in Albion's laboratory under clean conditions to produce single dissolved metals composite sample for analysis.

Freshwater entering the plant site was sampled at the water house. Sampling was done from a metal faucet tap on the main freshwater supply line coming into the plant. To minimize the chance for contamination and to obtain a representative sample, the valve was opened and allowed to purge for several minutes prior to taking the sample.

All samples collected were shipped on ice (< 4.0 deg C.) to Albion's facility by overnight delivery. Samples were preserved and composited (as described above) under clean conditions upon receipt at Albion.

Tyson Foods (Richmond VA) Clean Metals Study
Final Trace Element Data for Sampling Event # 1 (Collected 12-13 July 1999)
(All concentrations in ug/L= ppb)

| Sample No | Start Date/ Time | End Date/Time | Location | Sample Type | Processing | Matrix | Anal. Batch | Method | Cu | Ni | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Metals Samples** | | | | | | | | | | | |
| B-824 | 7/12/99 1024 | 7/13/99 1024 | Outfall 001 | 24 hr. comp. | Total Rec. | Effluent | 8/11/99 | EPA 1638 | 5.7 | 1.8 | |
| B-831 | 7/12/99 1230 | | Outfall 001 | Grab # 1 | Diss. | Effluent | 8/11/99 | EPA 1638 | 5.8 | 2.5 | Gravimetric composite |
| B-835 | 7/12/99 2033 | | Outfall 001 | Grab # 2 | Diss. | Effluent | 8/11/99 | EPA 1638 | | | of equal aliquots of 3 |
| B-839 | 7/13/99 0842 | | Outfall 001 | Grab # 3 | Diss. | Effluent | 8/11/99 | EPA 1638 | | | separate dissolved grabs |
| B-820 | 7/12/99 1610 | | Water House | Drinking HOH | Total Rec. | Drink. HOH | 8/11/99 | EPA 1638 | 15.6 | 0.30 | |
| **Field Quality Assurance (QA) Samples** | | | | | | | | | | | |
| **Equipment Blanks** | | | | | | | | | | | |
| B-814 | | | Albion | Bottle Blank | Diss. | DIW | 7/6/99 | EPA 1638 | < 0.15 | < 0.3 | |
| B-816 | | | Albion | Sampler Blank | Diss. | DIW | 7/6/99 | EPA 1638 | < 0.15 | < 0.3 | |
| **Field Blanks** | | | | | | | | | | | |
| B-818 | 7/12/99 0926 | | Outfall 001 | Grab F-BLK | Total Rec. | DIW | 8/11/99 | EPA 1638 | < 0.15 | < 0.3 | |
| B-828 | 7/12/99 1226 | | Outfall 001 | Grab F-BLK | Diss. | DIW | 8/11/99 | EPA 1638 | < 0.15 | < 0.3 | |
| **Field Duplicates** | | | | | | | | | | | |
| B-824 | 7/12/99 1024 | 7/13/99 1024 | Outfall 001 | 24 hr. comp. | Total Rec. | Effluent | 8/11/99 | EPA 1638 | 5.7 | 1.8 | |
| B-825 | 7/12/99 1024 | 7/13/99 1024 | Outfall 001 | 24 hr. FDUP | Total Rec. | Effluent | 8/11/99 | EPA 1638 | 5.8 | 2.1 | |
| Relative percent difference (RPD) | | | | | | | | | 1.7 | 16.3 | |
| B-831 | 7/12/99 1230 | | Outfall 001 | Grab # 1 | Diss. | Effluent | 8/11/99 | EPA 1638 | 5.8 | 2.5 | Gravimetric composite |
| B-835 | 7/12/99 2033 | | Outfall 001 | Grab # 2 | Diss. | Effluent | 8/11/99 | EPA 1638 | | | of equal aliquots of 3 |
| B-839 | 7/13/99 0842 | | Outfall 001 | Grab # 3 | Diss. | Effluent | 8/11/99 | EPA 1638 | | | separate dissolved grabs |
| B-832 | 7/12/99 1231 | | Outfall 001 | Grab # 1 FDUP | Diss. | Effluent | 8/11/99 | EPA 1638 | 5.9 | 2.5 | Gravimetric composite |
| B-836 | 7/12/99 2035 | | Outfall 001 | Grab # 2 FDUP | Diss. | Effluent | 8/11/99 | EPA 1638 | | | of equal aliquots of 3 |
| B-840 | 7/13/99 0846 | | Outfall 001 | Grab # 3 FDUP | Diss. | Effluent | 8/11/99 | EPA 1638 | | | separate dissolved grabs |
| RPD | | | | | | | | | 1.6 | 2.2 | |

APPROVED: P.N. Boothe

# ATTACHMENT K

- **Public Notice**

AUTHORIZATION FOR PUBLIC NOTICE BILLING

TO

VPDES PERMIT APPLICANT

I hereby authorize the Department of Environmental Quality to have the cost of publishing a public notice billed to the Agent/Department shown below. The public notice will be published once a week for two consecutive weeks in the THE RICHMOND TIMES DISPATCH.

Authorizing Agent: _____
Signature

Applicant's Address: 13264 Mountain Road
Glen Allen, Virginia 23059

Telephone Number: (804) 798-8357, ext 305

Permit No. VA0004031-Reissuance
Attn: Clinton T Shettle

# ATTACHMENT L

- Excerpts from EPA's web site on Effluent Limitations Guidelines and New Source Performance Standards for the Meat and Poultry Products Point Source Category, Sept. 8, 2004.

- Excerpts from EPA's web site on 40 CFR Part 136.3

- Independent renderers of meat and poultry products that use greater than 10 million pounds per year of raw material;
- Poultry first processors (slaughterhouses) that slaughter more than 100 million pounds per year; and
- Poultry further processors that generate more than 7 million pounds per year of finished products (examples: ready-to-cook chicken cutlets or ground turkey).

The final rule also applies to direct discharges of wastewater from ***new*** poultry processors at lower production thresholds. Specifically, the final rule applies to new

- Poultry first processors (slaughterhouses) that slaughter less than or equal to 100 million pounds per year; and
- Poultry further processors that generate less than or equal to 7 million pounds per year of finished products.

**What are the costs and pollutant reductions for the new requirements?**

The regulation revises the existing effluent guidelines for the meat industry by adding ammonia and total nitrogen limits for meat slaughterhouses, and total nitrogen limits for meat further processors and independent renderers. For poultry slaughterhouses and further processors, the rule establishes limits for conventional pollutants, ammonia, and total nitrogen.

EPA estimates reductions in the discharge of total nitrogen of about 27 million pounds per year and reductions of conventional pollutants (e.g., BOD, total suspended solids, oil and grease) of about 4 million pounds per year. EPA estimates water quality benefits of about $2.6 million, primarily from increased recreational opportunities, such as swimming and fishing. There are likely to be other ecological benefits, although these are harder to quantify. EPA estimates compliance costs of $58 million per year.

**How to Get Additional Information**

For more information, please call Samantha Lewis at (202) 566-1058, or send an email to lewis.samantha@epa.gov. You can also learn more about this final rule by visiting EPA's Internet web site at http://www.epa.gov/guide/mpp.

DATES: This regulation shall become effective October 8, 2004. The Director of the Federal Register approves the incorporation by reference on October 8, 2004, of certain publications listed in this rule in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. For judicial review purposes, this final rule is promulgated as of 1:00 p.m. (Eastern time) on September 22, 2004, as provided in 40 CFR 23.2.

ADDRESSES: The docket for today's final rule is available for public inspection at the Water Docket in the EPA Docket Center, (EPA/DC) EPA West, Room B102, 1301 Constitution Ave., NW., Washington, DC.

FOR FURTHER INFORMATION CONTACT: For additional technical information contact Samantha Lewis at (202) 566-1058. For additional economic information contact James Covington at (202) 566-1034.

SUPPLEMENTARY INFORMATION:

General Information

E. What Are the Compliance Dates for Today's Final Rule?

Each National Pollutant Discharge Elimination System (NPDES) permit must include all technology-based effluent limitations promulgated by EPA. Consequently, all reissued permits for existing direct dischargers must require compliance with today's limitations. Direct dischargers that are new sources must comply with applicable new source performance standards (NSPS) on the date the new sources begin discharging. For purposes of the revised NSPS being promulgated today, a source is a new source if it commences construction after October 8, 2004.

Today's rule does not revise the new source performance standards for wastewater discharges from small meat products facilities (i.e., those new meat facilities whose production is below the subcategory-specific production threshold) in Subparts A-I. Therefore, the respective new source dates for small facilities in Subparts A-I are not affected by today's final rule.

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E. Executive Order 13132: Federalism
F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments
G. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks
H. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use
I. National Technology Transfer and Advancement Act
J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
K. Congressional Review Act

## I. Definitions, Acronyms, and Abbreviations Used in This Document

BPT--Best practicable control technology currently available, as defined by section 304(b)(1) of the Act

BCT--Best conventional pollutant control technology, as defined by section 304(b)(4) of the Act

BAT--Best available technology economically achievable, as defined by section 304(b)(2)(B) of the Act

MPP--Meat and Poultry Products point source category

NODA--Notice of Data Availability (August 13, 2003; 68 FR 48472)
Nonconventional Pollutants--Pollutants that have not been designated as either conventional pollutants or priority pollutants

NSPS--New Source Performance Standards

PSES--Pretreatment standards for existing sources of indirect discharges, under section 307(b) of the Act
PSNS--Pretreatment standards for new sources of indirect discharges, under sections 307(b) and (c) of the Act

TDD--Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat and Poultry Products Point Source Category (EPA-821-R-04-011)

## VI. Applicability

### A. To Whom Does This Rule Apply?

This regulation applies to meat facilities and poultry and small game facilities (referred to as ``poultry facilities'' for convenience) that discharge their wastewater directly into waters of the U.S. (e.g., stream, lake, ocean) and are required to obtain an NPDES permit. Facilities that send their wastewater to a publicly owned treatment works (POTW) are not subject to this final rule; they remain subject to 40 CFR 403 and their local limits (see sections VI.G and XII.A.2).

Facilities above certain production thresholds (see Table VI.H-1 for subcategory-specific production thresholds) who are involved in any of the following activities are subject to this rule:

- Slaughtering (first processing) meat or poultry or both
- Further processing meat or poultry or both
- Rendering meat or poultry or both.

technology basis is equivalent to the technology basis upon which EPA is setting BAT. In selecting its technology basis for today's NSPS, EPA considered all of the factors specified in CWA section 306, including the cost of achieving effluent reductions. EPA has thoroughly reviewed the costs of such technologies and has concluded that such costs do not present a barrier to entry (see the Economic and Environmental Benefits Analysis in the rulemaking record). The Agency also considered energy requirements and other non-water quality environmental impacts for the new source technology basis and found no basis for any different standards from those selected for NSPS. Therefore, EPA concluded that the NSPS technology basis chosen constitutes the best available demonstrated control technology. For a discussion on the compliance date for new sources, see Section XII of today's final rule.

EPA decided not to establish BPT, BCT, or BAT limitations for small facilities in Subcategories K and L (poultry first and further processing, respectively) or to revise current limitations and standards for small facilities in Subcategories A-I (see Table VI.H-1). EPA is establishing new source performance standards for new small facilities in Subcategories K and L. EPA's bases for not promulgating revised limitations or standards for small facilities are explained in the following sections. Finally, EPA decided not to establish pretreatment standards for all existing and new indirect dischargers (PSES and PSNS) for the reasons discussed in the NODA (68 FR 48477; August 13, 2003) and in Section VI.G of today's rule.

List of Subjects in 40 CFR Part 432

Environmental protection, incorporation by reference, meat and meat products, poultry and poultry products, waste treatment and disposal, water pollution control.

Dated: February 26, 2004.
Michael O. Leavitt,
Administrator.

• For the reasons set forth in this preamble, 40 CFR part 432 is revised as follows:

PART 432--MEAT AND POULTRY PRODUCTS POINT SOURCE CATEGORY

Sec


Authority: 33 U.S.C. 1311, 1314, 1316, 1317, 1318, 1342 and 1361.

subsequently processes carcasses into cured, smoked, canned or other prepared meat products.

(i) Poultry means products derived from the slaughter and processing of broilers, other young chickens, mature chickens, hens, turkeys, capons, geese, ducks, small game fowl such as quail or pheasants, and small game such as rabbits.

(j) Raw material means the basic input materials to a renderer composed of animal and poultry trimmings, bones, blood, meat scraps, dead animals, feathers and related usable by-products.

(k) Slaughterhouse means a facility that slaughters animals and has as its main product fresh meat as whole, half or quarter carcasses or small meat cuts.

(l) The approved methods of analysis for the following six parameters are found in Table 1B in 40 CFR 136.3. The nitrate/nitrite part of total nitrogen may also be measured by EPA Method 300.0 (incorporated by reference, see Sec. 432.5).

(1) Ammonia (as N) means ammonia measured as nitrogen.

(2) $BOD_5$ means 5-day biochemical oxygen demand.

(3) O&G means total recoverable oil and grease.

(4) O&G (as HEM) means total recoverable oil and grease measured as n-hexane extractable material.

(5) Total Nitrogen means the total of nitrate/nitrite and total Kjeldahl nitrogen.

(6) TSS means total suspended solids.

Sec. 432.3 General limitation or standard for pH.

Any discharge subject to BPT, BCT, or NSPS limitations or standards in this part must remain within the pH range of 6 to 9.

Sec. 432.5 Incorporation by reference.

(a) The material listed in this section is incorporated by reference in the corresponding sections in this part, as noted. The Director of the Federal Register approves the incorporation by reference of this material in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. This material is incorporated as it exists on the date of the approval, and notice of any change in this material will be published in the Federal Register. The material is available for purchase at the address in paragraph (b) of this section and is available for inspection at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC, or at the EPA Docket Center, 1301 Constitution Ave., NW., EPA West Room B-102, Washington, DC.

(b) The following material is available for purchase from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free telephone number is (800) 553-6847.

(1) ``Method 300.0 Determination of Inorganic Anions by Ion Chromatography'' (Revision 2.1) found in ``Methods for the Determination of Inorganic Substances in Environmental Samples,'' EPA 600-R-93/100 (order number PB94-120821), August 1993, IBR approved for Sec. 432.2(l).

(2) [Reserved]

Sec. 432.115 New source performance standards (NSPS).

Any source that is a new source subject to this subpart must achieve the following performance standards:

(a) Facilities that slaughter no more than 100 million pounds per year (in units of LWK) must achieve the following performance standards:

Performance Standards
[NSPS]

| Regulated parameter | Maximum daily \1\ | Maximum monthly avg.\1\ |
|---|---|---|
| Ammonia (as N) | 8.0 | 4.0 |
| BOD5 | 26 | 16 |
| Fecal Coliform | ( \2\ ) | ( \3\ ) |
| O&G (as HEM) | 14 | 8.0 |
| TSS | 30 | 20 |

\1\ mg/L (ppm).
\2\ Maximum of 400 MPN or CFU per 100 mL at any time.
\3\ No maximum monthly average limitation.

(b) Facilities that slaughter more than 100 million pounds per year (in units of LWK) must achieve the following performance standards:

Performance Standards
[NSPS]

| Regulated parameter | Maximum daily \1\ | Maximum monthly avg.\1\ |
|---|---|---|
| Ammonia (as N) | 8.0 | 4.0 |
| BOD5 | 26 | 16 |
| Fecal Coliform | (\2\) | (\3\) |
| O&G (as HEM) | 14 | 8.0 |
| TSS | 30 | 20 |
| Total Nitrogen | 147 | 103 |

\1\ mg/L (ppm).
\2\ Maximum of 400 MPN or CFU per 100 mL at any time.
\3\ No maximum monthly average limitation.

Sec. 432.116 Pretreatment standards for new sources (PSNS).
[Reserved]

Sec. 432.117 Effluent limitations attainable by the application of the best control technology for conventional pollutants (BCT).

Except as provided in 40 CFR 125.30 through 125.32, any existing point source subject to this subpart must achieve the following effluent limitations representing the application of BCT: Limitations for $BOD_5$, TSS, O&G (as HEM), and fecal coliform are the same as the corresponding limitation specified in Sec. 432.112.

# Title 40: Protection of Environment

PART 136—GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS

§ 136.3 Identification of test procedures.

Table IB_List of Approved Inorganic Test Procedures

| Parameter, units and method | Reference (method number or page) | |
|---|---|---|
| | EPA 1, 35 | Standard Methods [Edition(s)] |
| 41. Oil and grease_Total recoverable, mg/L: | | |
| Gravimetric (extraction)..... | 413.1..... | 5520B [18th, 19th, 20th] \38\. |
| Oil and grease and non-polar material, mg/L: Hexane extractable material (HEM): n-Hexane extraction and gravimetry. | 1664A \42\..... | 5520B [18th, 19th, 20th] \38\. |
| Silica gel treated HEM (SGT-HEM): Silica gel treatment and gravimetry. | 1664A \42\..... | |

Table 1B Notes:

\1\ ``Methods for Chemical Analysis of Water and Wastes,'' Environmental Protection Agency, Environmental Monitoring Systems Laboratory_Cincinnati (EMSL-CI), EPA-600/4-79-020, Revised March 1983 and 1979 where applicable.

\35\ Precision and recovery statements for the atomic absorption direct aspiration and graphite furnace methods, and for the spectrophotometric SDDC method for arsenic are provided in Appendix D of this part titled, ``Precision and Recovery Statements for Methods for Measuring Metals''.

\38\ Only use Trichlorotrifluorethane (1,1,2-trichloro-1,2,2-trifluoroethane; CFC-113) extraction solvent when determining Total Recoverable Oil and Grease (analogous to EPA Method 413.1). Only use n-hexane extraction solvent when determining Hexane Extractable Material (analogous to EPA Method 1664A). Use of other extraction solvents is strictly prohibited.

\42\ Method 1664, Revision A ``n-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry'' EPA-821-R-98-002, February 1999. Available at NTIS, PB-121949, U.S. Department of Commerce, 5285 Port Royal, Springfield, Virginia 22161.

Revised 2/2003

## *State "Transmittal Checklist" to Assist in Targeting Municipal and Industrial Individual NPDES Draft Permits for Review*

### Part I. State Draft Permit Submission Checklist

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

Facility Name: Tyson Foods, Inc. – Glen Allen

NPDES Permit Number: VA0004031

Permit Writer Name: Clinton T. Shettle

Date: 8/2/05

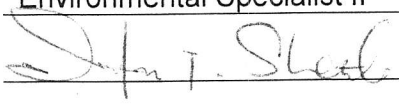
**Major** [ ] **Minor** [ X ] **Industrial** [X] **Municipal** [ ]

| I.A. Draft Permit Package Submittal Includes: | Yes | No | N/A |
|---|---|---|---|
| 1. Permit Application? | x | | |
| 2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)? | x | | |
| 3. Copy of Public Notice? | x | | |
| 4. Complete Fact Sheet? | x | | |
| 5. A Priority Pollutant Screening to determine parameters of concern? | x | | |
| 6. A Reasonable Potential analysis showing calculated WQBELs? | x | | |
| 7. Dissolved Oxygen calculations? | | x | |
| 8. Whole Effluent Toxicity Test summary and analysis? | x | | |
| 9. Permit Rating Sheet for new or modified industrial facilities? | | | x |

| I.B. Permit/Facility Characteristics | Yes | No | N/A |
|---|---|---|---|
| 1. Is this a new, or currently unpermitted facility? | | x | |
| 2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit? | x | | |
| 3. Does the **fact sheet** or permit contain a description of the wastewater treatment process? | x | | |

## Part III. Signature Page

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

| | |
|---|---|
| Name | Clinton T. Shettle |
| Title | Environmental Specialist II |
| Signature |  |
| Date | 8/2/2005 |

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**Piedmont Regional Office**

**Page ___ of ____**

| DIVISION | COMPANY NAME | PURPOSE | CHECK NUMBER | CHECK AMOUNT |
|---|---|---|---|---|
| PRO | Nestle Purina Petcare Co | Tank Registration | 40002677 | $50.00 |
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**Received By:** _____

**Date:**